

REMARKS

Claims 1-22 are pending.

Claims 1-22 are rejected.

Claims 1 and 19 are amended.

Objections to the Specification

Applicant has amended the specification to correct the errors as suggested by the examiner.

No new matter has been added.

35 USC 112, second paragraph

Claim 1 is amended to read "solid residue" rather than the "solid by-product".

Claim 1 is further amended to correct an obvious mistake. In step (vi) should read ...passing the aqueous liquor from step (v) into a fermentation stage....

Claim 1 is further amended to insert the term "acidic" before mixture in steps (ii) and (iii)

Support for this amendment may be found on page 6, the first three paragraphs. These three paragraphs teach the acidified suspension by combining the particulate material with a dilute acid. Examples of acids are listed in paragraph two. And paragraph three on page 6, states that the acid ideally has a pKa below 4.

Furthermore the present examples 1 and 2 show flocculation of an acidic mixture.

Claim 19 is amended to read "solid residue rather than the "solid-by-product".

Claim 19 is also amended to eliminate the phrase "analogous materials."

Claims 22 is amended by deleting the term "compound" and replacing with "product".

The applicant believes the above amendments address all of the 112, second paragraph rejections.

No new matter is added.

35 USC 103(a)

Claims 1-11 and 19-21 are rejected under 35 USC 103(a) as being unpatentable over Brink US 5,536,325 in view of NREL report by Wooley and RU 2077594.

When considering the claimed process as a whole it becomes apparent that it is not rendered obvious by Brink (US 5,536,325), Wooley et al. (NREL report) and Vyglazov et al. (RU 2077594).

Brink (US 5,536,325) is directed to increasing sugar yields in a two stage process, wherein lignocellulosic material is hydrolyzed under acidic conditions (cf. claim 2, col. 5, lines 54-58).

For the following reasons Brink differs from the present process in that:

- a) Ferric and/or aluminum salts are used as flocculants to separate suspended solids from a hydrolysate, wherein the flocculation occurs in neutralization unit 156, i.e. after neutralizing the acidic medium (cf. col. 11, lines 5-7 and 17-23; fig. 4). However, according to the present invention the flocculating agents are added to the acidic solids bearing mixture (claim 1, step (iii) and characterizing part).
- b) The solids which are flocculated according to Brink are the solids resulting from neutralization in the acidic medium (cf. col. 11, lines 5-7; col. 6, lines 4-12). These solids do not contain any polysaccharide. At the time of neutralization the insoluble biomass which may contain polysaccharides has already been separated by centrifugation (cf. col. 5, lines 58-61). Hence, solids of the neutralization unit are clearly different to the solid residue according to the present invention containing the second polysaccharide which is harder to hydrolyse (cf. claim 1, steps (ii) and (iii)).
- c) There is no disclosure of employing as a flocculating agent any water-soluble polymers, water-swallowable polymers or charged microparticulate material.
- d) Both hydrolysis stages are carried out by the addition of an acid, in particular nitric acid (cf. example), whereas the second hydrolysis step according to the present invention is carried out enzymatically (claim 1, step vii).

Hence, any combination with Brink cannot result in the claimed process. In detail:

Wooley et al. (NREL report) relates to a biomass-to-ethanol process based on co-current dilute acid prehydrolysis along with simultaneous enzymatic saccharification and co-fermentation.

Vyglazov et al. (RU 2077594) describe a method for purification of a hydrolysate of a vegetable material using flocculants, whereby the efficiency of purification is increased within a pH range of 3.0-4.0. The flocculants are introduced into the cooled hydrolysate to form suspended particles, the resulting mixture is then neutralized, followed by separating the suspended solids (cf. Derwent abstract), i.e. the separation is carried out under neutral conditions.

Contrary thereto, according to the present invention the separation is carried out under acidic conditions: the flocculated solid residue containing the second polysaccharide is separated from an acidic mixture. This is evident from step (iv) wherein the solid residue is washed free from the acid (cf. page 8, last paragraph to page 9, 1st paragraph).

Therefore, it is clearly not obvious to one skilled in the art to modify the process of Brink by applying an enzymatic hydrolysis as disclosed by Wooley and by applying the flocculants disclosed by Vyglazov.

Based on the process described by Brink, there is neither any motivation for one skilled in the art to replace the ferric and aluminum salts used as flocculants by the polymeric flocculants of Vyglazov; because the flocculants of Vyglazov would not fulfill the additional function of the ferric and aluminum salts of Brink, i.e. the catalyst function (cf. col. 2, lines 1-5), and further, they would not be recycled. In addition, the combination of Brink and Vyglazov does not result in the solids-liquid separation step as claimed in step (iii) of the present invention, because the flocculants used would be applied to the neutralized mixture of the hydrolysate to flocculate the suspended solids obtained by neutralization and not to an acidic mixture containing the second polysaccharide which is harder to hydrolyze.

Also, no hint is given in Brink that a person skilled in the art would replace the second acidic hydrolysis step by an enzymatic one. Brink discloses specifically that the hydrolysis in both stages is preferably accomplished by use of nitric acid at a pH of below 1.7 (claim 2; col. 23, line 39 to col. 24, line 5) in order to maximize production of glucose without substantial degradation. Therefore, Brink teaches away from employing an enzymatic hydrolysis step because such a hydrolysis step requires higher pH conditions as microorganisms are involved. Hence, one skilled in the art would not consider the process of Wooley either.

Hence, claims 1-11 and 19-21 are unobvious.

Claims 12-18 are rejected under 35 USC 1039a) as being unpatentable over Brink as in view of Wooley and Vyglazv as above, and further in view of Moffett US 6,132,625.

Moffett (US 6,132,625) relates to a process of separating biosolids from an aqueous stream resulting from animal or vegetable processing operations using an anionic inorganic colloid and a cationic polyacrylamide as flocculants (cf. claim 1). In fact, there is a disclosure of using anionic microparticulate material.

As discussed above, the process according to claim 1 is not rendered obvious by Brink alone or in combination with any other reference, especially combined with Wooley and Vyglazov. Similarly to Vyglazov, it is not obvious to a skilled person to apply the anionic microparticulates of Moffett to the neutralized mixture of Brink. And even if the process of Brink had been modified by a person skilled in the art using anionic microparticulates, one would obtain a process wherein the anionic microparticulates are added to the neutralized mixture of the hydrolysate to flocculate the suspended solids obtained by neutralization and not to flocculate the solid residue containing the second polysaccharide, i.e. in any case a person skilled in the art would not arrive at the instant invention.

Hence, claims 12 to 18 are based on an inventive step.

Claim 22 is rejected under 35 USC 103(a) as being unpatentable over Brink as in view of Wooley and Vyglazov as above, and further in view of Tedder, 5,215,902.

Tedder (US 5,215,902) relates to a process of producing alcohol wherein said alcohol is separated from the fermentation broth by solvent extraction (cf. claim 1), which is a well known method of separating ethanol.

As discussed above, the process according to claim 1 is not rendered obvious by Brink alone or in combination with any other reference, especially combined with Wooley and Vyglazov. Claim 22 is dependent from claim 1, therefore, the subject-matter of claim 22 is also unobvious.

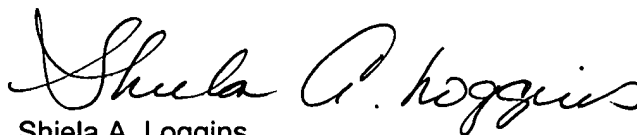
As a conclusion, claim 1 and its dependent claims are novel and unobvious in view of the cited documents.

Reconsideration and withdrawal of the rejection of claims 1-22 is respectfully solicited in light of the remarks and amendments *supra*.

Since there are no other grounds of objection or rejection, passage of this application to issue with claims 1-22 is earnestly solicited.

Applicants submit that the present application is in condition for allowance. In the event that minor amendments will further prosecution, Applicants request that the examiner contact the undersigned representative.

Respectfully submitted,

A handwritten signature in black ink, reading "Shiela A. Loggins". The signature is fluid and cursive, with the first name "Shiela" being more prominent and the last name "Loggins" following in a similar style.

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